Amendments to the Specification:

Please replace the earlier-submitted text of the **Abstract of the Disclosure** with the text presented here. Kindly amend the rest of the **Specification** as follows:

TITLE OF INVENTION

Applicant

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Citizenship

Indian

Residence

Delhi, INDIA

Title

~~Two-wheel electric~~ Electric motor vehicle with passenger opening through ring motor ~~where wheels are parallel to each other, with a provision for connecting two or more such vehicles in tandem being steered by the front one~~

CROSS-REFERENCE TO RELATED APPLICATIONS

~~Not Applicable~~ Provisional application No.60/182,772, filed on Feb. 14, 2000.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

REFERENCE TO A MICROFICHE APPENDIX

Not Applicable

BACKGROUND OF THE INVENTION

[[All]] Most of the contemporary electrically driven motor vehicles are designs which have been standardized with an internal-combustion machine as the power pack. As the internal-combustion engine runs best at an optimum [[RPM,]] rpm, and structurally has to be in a cubic form, the need to have gears and a lot other mechanical parts is always there.

While switching over to an electric-drive principle to run a motor vehicle, the first efforts had been to replace the internal-combustion engine with a [[high-RPM]] high-rpm electric motor. But then there was this need to have a sizeable number of accumulators which, of course, would weigh down the vehicle considerably. It was difficult to create extra space for the accumulators; and changing the batteries in case of emergencies was cumbersome. Additionally, there had been a trend in the recent past to go for small-wheeled vehicles to reduce physical size and to increase ~~manoeuvreability.~~ maneuverability. This tended to increase the rolling friction between the wheels and the road surface, as the ratio between the chord which forms at the road contact and the circumference of the [[tyre]] tire increases with increasingly smaller wheels. It is a major drawback for electric-vehicle design; reducing the range of the vehicle for a full battery charge.

There had been designs in the past which utilized an electric motor inside the wheel. On many occasions the wheel is turned into a wheel motor. But as there are no gears in the case of a direct-driven wheel motor, in order to generate high torques, either the diameter or the thickness of the wheels have to be increased: This makes the wheels heavy. To hold together those wheels, the axles and the chassis (or the shell) all have to be stronger and thus would be heavier than in a vehicle driven by a [[centrally-located]] centrally located power pack.

How to do away with the numerous mechanical parts [[which]] that weigh down an electric motor vehicle? And how to reduce the rolling friction to reduce the cruising power requirement of an electric motor vehicle? These were the two major pointers leading to this invention.

BRIEF SUMMARY OF THE INVENTION

This invention fully avoids the earlier problems by increasing the diameter and reducing the number of wheels. The wheels, two in number, get integrated with the shell of the vehicle, doing away with the axle. The increased diameter of the wheel motor provides more amount of torque at slow speeds without using any gears. The shell of this electric motor vehicle is basically in the form of a cylinder, the circular side of which faces the surface on which the vehicle travels; both the end of the cylinder remain vertical, and these two faces also act as openings. The two wheels in annular form are mounted near the two side faces. The hub of the wheel houses the permanent-magnet rotor, while the circular stator with [[low-Voltage]] low-voltage windings is mounted on the basically cylindrical shell of the vehicle, which acts as the axle for both the wheels. In principle, this electric motor vehicle is built inside an enlarged and hollowed out axle. The electrical energy storage devices are kept near that surface of the shell the other side of which always faces the ground; this positioning of the electrical energy storage devices makes the [[centre]] center of gravity of the vehicle low and lends stability to the design -- this is possible, because all the electrical energy accumulators and superconductor assemblies are heavy. The two wheel motors on both the sides have individual inverter drives also effecting regenerative braking when needed. Steering is accomplished by differential rotation of the two giant wheels. An electrical or wireless link between two or more such vehicles would enable all-thus-linked vehicles to travel in tandem, main steering being done by the vehicle on the front; this will simulate the present-day multi-wheel modes of transport, with the ease of detachability and flexibility.

Thus, this invention avoids the use of gears, a mechanical steering, suspensions and pneumatic [[tyres;]] tires; it has a much greater torque-generation compared to other motor-wheel designs. The rolling coefficient of friction is low, because the chord-versus-the-wheel-circumference ratio is low due to the increased effective diameter of the wheel (which is more like a hub). This invention helps to increase the effective ~~travelling~~ traveling range of an electrical vehicle with this structural design philosophy. As the electrical energy accumulators are placed at a level close to the ground, replacing them is easier compared to

the existing design of electric motor vehicles. With efficiency, simplicity and flexibility, this invention may be the harbinger of the imminent advent of a truly electrical motor vehicle.

The characteristic features of the invention are set forth, in particular, in the appended claims; however, the following description in detail in context to the drawings facilitates a greater understanding of the unique concepts [[which]] this invention embodies. But this should be taken as illustrative, rather than restricting the scope of the ideas set forth in the section of [[Claims.]] <u>claims.</u> The principles and features of this invention may be utilized in applications outwardly dissimilar but in essence not departing from the scope of this invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG.1 is a side view of a two-wheel electric motor vehicle in accordance with the present invention where the two wheels are parallel to each other. The wheels are shown resting on level ground, as well as a plane with a 20° incline.

FIG.2 is a plan view of the electric motor vehicle in accordance with the present invention, on a 11/2-times bigger scale than FIG.1.

FIG.3 is a general front view of the two-wheel electric motor vehicle where the wheels are parallel to each other in accordance with the present invention, on the same scale as used in FIG.2. The two wheels are shown resting on level ground.

DETAILED DESCRIPTION OF THE INVENTION

FIG.1 shows the side view of the vehicle. The total height of the vehicle is nearly 50 inches. In this present form, it is designed to [[accomodate]] accommodate two persons with some luggage space at the back. The seats are marked S. The batteries are placed below the seats in ~~the area~~ battery enclosure [[marked]] BAT (FIG.1 and FIG.2). There is a provision to keep 4 Nos. of ordinary 200AH, [[12V. Lead-acid batteries.]] 12V lead acid batteries. The total weight of the batteries is 240 kgs. The position of [[the]] battery enclosure BAT keeps the [[centre]] center of gravity of the vehicle very low; this, coupled with the eccentric loading on the vehicle, provides stability to the vehicle, in spite of its having only two parallel wheels. The batteries could be placed in two arrangements. One is side by side, so that the batteries could be taken out from the direction [[labelled]] of BP in FIG.1. ~~The Battery Protector,~~ Battery protector BP is made of material having good impact strength capable of withstanding shock from the rear. A hinged joint at [[the]] axis marked HN (FIG.1), allows battery protector BP to swivel down and rest on the ground on its edge. Thus facilitating the removal or insertion of the batteries from the rear. The batteries could also be arranged in a transverse manner, as shown in FIG. 2. In this case, the batteries have to be accessed from the side doors on both the sides of the vehicle. As the batteries, in this arrangement, are placed in the cavity behind [[the]] direct-drive motor M (FIG.1 and FIG.2), the ~~circular rim~~ toroidal stator of [[the]] direct-drive motor M obstructing (indicated by OBS in FIG.1) the bottom ~~sideways edge~~ corners of the [[battery,]] batteries, it is not possible to simply slide the batteries out one by one. The backrests have to fold down on the seats, while the seats having an arrangement to get lifted slightly to make sufficient clearance for the batteries; then a ~~pneumatically-operated robber~~ pneumatically operated rubber bag placed below the batteries as a collapsed cushion is inflated to get the batteries lifted enough to be able to slide them out. This arrangement is slightly more complicated than the earlier-described battery-removal procedure; but it makes the vehicle shell stronger by integrating battery protector BP with the shell, thus reducing the number of joints in the vehicle shell. The top and front sides of the battery enclosure have to be strong and fully linked with the structure of the shell and, at the extremities, with [[the]] direct-drive rim motors M: So that, in case of an accidental collision, the batteries do not damage the legs of the occupants of the seats. The linking of the two ends

of the shell with the body element of the battery enclosure also increases the overall strength of the vehicle shell.

The back rests of the seats could be adjusted somewhat to obtain different reclining angles. In FIG.1, the areas marked B on the front and rear both indicate the light-weight plastic bumpers. They have an elevated face (FIG.2) marked EL to offer a limited length of their full face in case of a collision, to avoid the shock getting transferred on to the wheels and distorting them. Though, the ridged sheet-metal rims of the wheels (FIG.2) offer a degree of flexibility and resilience necessary to withstand the rough rides. The [[tyres]] tires are huge in diameter (nearly 50 inches), but are very thin (just an inch). This reduces the rolling friction; avoids the use of any kind of suspension or shock absorbers; and opens the possibility of using a solid low-cost rubber [[tyre (FIG.3, TYRE).]] tire (FIG.3, TIRE).

The doors on both the sides of the vehicle hinge at the axis near the back rest of the seats (AA in FIG.1); the height of the doors is nearly 3 feet. The possible sliding glass portions of the window is marked WN in FIG.1. The small area on the right-hand side of [[the]] vertical [[cord]] axis AA (FIG.1) is immovable and is fixed to the vehicle shell.

The windscreen vertically, in a circular fashion, spans points WW (FIG.1). The head lamps are placed in [[the]] niche HL (FIG.1) -- shown more clearly in FIG.3. In order to conserve power, use is made of 2 Nos. of 20W fluorescent tubes driven by high frequency drivers. The right and left turn indicators are marked [[T.I.L.]] TIL in FIG.3. The two fluorescent tubes with suitable cylindrical reflectors produce high and low beams; the Fresnel lenses in the path of light help to further focus the light beam.

On the rear-side end of the vehicle, there is a boot [[space; the]] space, boot hatch door ~~may open at point marked~~ BH in FIG.1. There are two locations for keeping the various electronic controllers. One is the rear side of the seat back rests; the other is the place marked E in FIG.1. The traction, steering, braking and communication with the virtually-linked similar vehicles in tandem: [[All]] all are accomplished using this controller and drives. There

are two separate drives for the two permanent-magnet [[AC]] ac motors working as direct-driving rim motors. By altering the [[RPM]] rpm of individual motors, steering of the vehicle is achieved. By stopping one motor entirely, the moving wheel of the vehicle draws a circle on the ground, the [[centre]] center of which is the point where the non-rotating wheel rests on the ground; this capability makes the turning radius very small, equal to the distance between the [[centres]] centers of the two [[tyres]] tires on the either side. Dynamic regenerative braking is also effected by the two drives; and is very effective, owing to the huge diameter of the motor. The stator is wound for 24V. [[DC,]] dc, and is epoxy encapsulated. The rotor consists of small ferrite magnets arranged on the rotating rim. The bearing of the motor is on the inside of the walls of the wine-glass-like shape (WG in FIG.2), ~~to where the arrow marked M points~~ adjacent to direct drive motor M in FIG.2. At the parting lines of the rotor and the stator, to protect the bearing from dirt, there are thin annular rubber curtains, against which there is an optional positive air pressure from the inside of the stator -- worked up by a small centrifugal fan pump which sucks filtered air from the inside of the vehicle and pushes it out through the leakage between the line of contact between the rubber curtain and the hub and the axle to prevent the entry of dust, dirt and water at low pressure heads.

In [[the]] case of the failure of the switching devices of one or both the drives, there is a provision for two parallel stopping drives which otherwise work as regenerative brakes to first charge two capacitors from the regenerative braking power and then to step up the capacitor voltage with a switching [[convertor]] converter and then to charge the batteries. To act as parking brakes, on points marked as (FIG.1) PBR, there are two small [[DC]] dc motors with integral gears driving two threaded shafts which in turn move threaded sliding blocks lined on their heads with [[braking]] brake material. Application of this braking arrangement involves the rotation of the geared [[DC]] dc motors in the positive direction in order to move the braking sliders towards the rotor's magnetic face. When the brake linings press against the rotor face, due to the enormous diameter of the rotor, the braking effectiveness is very good. In order to release this parking brake, the direction of motor rotation is reversed by reversing the ~~connection of~~ connections to the small [[DC]] dc motors electrically. This braking is indispensable while parking, as [[their]] there are no gears in this

vehicle and injecting a [[DC]] dc voltage in the rotor to achieve electromagnetic braking would unnecessarily drain the battery.

Steering, speed and braking are manually controlled by operating a wired or cordless joystick; the driver may sit at any location in the vehicle. Ground clearance even on an inclined surface is adequately demonstrated with reference to the line marked INCL. in FIG.1. It is also noticeably clear in FIG.3, just above the road surface marked R.

The number of batteries could be made just two, to make the vehicle lighter and go faster, with [[travelling]] traveling distance getting halved. By making the driver sit in a more crouched manner, the diameter as well as the breadth of the vehicle could be reduced to produce a midget-size vehicle, unlike the conventional bikes: A stable vehicle suitable for single occupancy, protecting the occupant from the vagaries of the weather.

Dynamic towing is achieved by attaching one or more similar vehicles behind or along the sides of the pilot vehicle. An electronic communication link permits the driver of the driver of the pilot vehicle to safely steer this train of identical vehicles; thus effecting the concept of splitting a conventional four-wheel vehicle, or joining up, as and when required. The vehicles following the pilot vehicle have a user-defined degree of ~~maneouvreability.~~ maneuverability. The addition of a towing link on the backside of this electric vehicle will enable it to work as a traction vehicle inside factories. Unlike conventional three-wheeled electrical traction vehicles, the driver sits inside a well-defined and protected space, though the overall size of the vehicle is smaller compared to its existing counterparts.

The peculiarities of this electric vehicle design make it very stable in dynamic performance. While applying brakes, the vehicle shell tends to rotate with the wheels, but the heavy battery compartment keeps moving forward, thus [[cancelling]] canceling out the likely swing of the shell anti-clockwise. The position of the occupants of the vehicle always remains gravitationally the same, reducing, possibly, stress while [[travelling]] traveling over inclines, ~~(marked INCL in FIG.1).~~ (INCL in FIG.1).

The batteries, even if replaced by fuel cells or superconductor assemblies, always have one common feature -- weight. The weight of the electrical energy storage or generating units could not possibly be reduced in near future. And in this design this concentration of weight lends itself remarkably well to the effective functioning of this electric motor vehicle.

To improve the dimensional stability of the shell, ridges are formed on the sheet-metal shell just at place where the shell forms a neck to [[accomodate]] <u>accommodate</u> the wheel motor, shown in FIG.2 and FIG.3 (RIDGES).

In a midget-sized single-seater version of the present vehicle, back rest is in a foldable form; two such back rests linked to both the sitting edges of the driver seat make it possible to sit inside the vehicle facing any of the two ends -- conventional front or rear -- and drive, as there are no mechanical linkages for driving this vehicle; and the joystick controller could be operated in any position.